



Plastics in the spotlight

Thanks to the development of innovative technologies, nearly everything used in the production of consumer goods can be advantageously replaced with plastic compounds

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Before reading any further, stop a moment and look around you. If you haven't before, it might be a good time to notice that plastics are part of our daily lives. They're everywhere: in chairs, tables, flooring, clothes, handbags, computers, pens, packaging and household goods in general; in cars... Whether hidden or in plain sight, just about everything contains a plastic component. Nevertheless, as you will soon discover, there is always something new coming on the market. There are still areas in which a wide range of plastics can advantageously replace traditional materials in many ways. And revolutionary products now being researched will soon come on the scene. New patents are being filed every day; new products are being launched almost at the same rate. Many things that once seemed to be the products of fiction-writers' fertile, imaginative minds are now a reality.

If you are into sports, you may already know that the soccer balls that will roll on the pitches in Germany during the 2006 World Cup will be made of plastic instead of cowhide. Developed by Adidas, it contains 20 hexagons and 12 pentagons made from several layers of synthetic materials. The outer layer is made from a special type of polyurethane that is highly resistant to abrasion and can withstand external pressure. The synthetic foam layer underneath gives the ball an extra kick and increases its speed. Also rounder than any leather ball could be, it contains a device that tells the referee (or umpire) when it has crossed

the goal line.

Most of the games will be played at Munich's brand-new stadium. Built using a plastic compound, its shape is reminiscent of a lizard, but it will be more like a chameleon, changing color to match the teams that are playing. A gigantic globe by Viennese sculptor André Heller was also unveiled in May. Commissioned for the 2006 World Cup, it contains nearly 5 km of plastic cable. Anyone going to watch the games will get a 20% discount on Germany's bullet trains, which are made from plastic and aluminum. "We have set up the best soccer infrastructure in the world," said Wolfgang Niersbach, Vice President of the World Cup organizing committee, in an interview with the German newspaper Deutsche Welle. "The 1974 World Cup (which also took place in Germany) was in the stone age."

There is much more to be said about plastics in the world of sports. Tennis and soccer shoes that absorb impact and prevent serious injuries to athletes resulted from technological developments in plastic compounds. These compounds are also used to make exercise equipment, artificial grass, and clothing made from fabrics that absorb sweat and regulate body temperature. These clothes are made from microcapsules containing special paraffins with resistant plastic coatings, applied to woven polyester and polyamide fabrics.

[The silent revolution](#)

Amyr Klink, Brazil's most famous and successful sailor and adventurer, is passionate about new technologies, especially plastics. His latest expedition – sailing around the world non-stop in a light catamaran – involves more plastics than ever. "The decks are non-skid; unloading and loading are done in a practical and rational way using standardized crates, and we store used oil in plastic containers. The ocean is an extremely aggressive environment, and conventional materials do not meet our needs. That is why we are making increasing use of all kinds of plastics. They offer a combination of outstanding qualities: they're resistant, durable, lightweight and easy to maintain," the seafarer explains. His most recent project – already tested, approved and implemented – involved the construction of floating equipment for ports and marinas made from expanded polystyrene (better known as Styrofoam) with a vinyl coating. "We achieved an excellent finish, and platforms that were once coated with fiberglass or

concrete and were made of blocks weighing 300 kilos per square meter are now lightweight and colorful, and can easily be set up at sea.” Ninety have already been installed in Brazil.

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Racecar driver Ingo Hoffman, 53, is now competing in his 34th season. He says that there is no comparison between today’s cars and the ones he drove back in 1972, at the beginning of his career. Their design, aerodynamics, on-board technology and safety equipment have changed completely. “People barely notice the changes. They adapt to them easily. But the fact is that cars have changed a lot, and they are still changing, becoming more efficient, economical, safe and attractive. Plastic has made a decisive contribution to that.”

Today’s touring vehicles contain an average of 150 kilos of plastic components. If they were made of metal, these same components would weigh 450 kilos. Even leather-upholstered luxury cars only have natural leather on the surface: the sides are made from “ecologically correct” synthetic leather. Modern car chassis are made from an impact-absorbing plastic compound that reduces the risk of pedestrian fatalities and the need for car repairs, since it returns to its original shape after a fender-bender. And a new kind of tire made from plastic mixed in with synthetic rubber is also emerging. This new material reduces wear and tear without losing traction, which makes traveling safer and more economical. It also improves the car’s response when braking on wet roads.

“Cold plastics” are being used to make speed bumps. They offer excellent resistance to abrasion, are non-skid, easy to install and remove, stick to the pavement and have high visibility day and night, even in rainy and foggy weather. Traffic signs that were once made of metal now contain a more durable combination of fiberglass and heat-fixed polyester. Fiberglass/polyester signs not only last longer but are less likely to be stolen due to their low resale value.

So plastics are found in cars, on the streets and highways, and in trucks and tractors, helicopters and planes, trains and rockets. They are used in all means of transportation, replacing metal because they are lighter, stronger, safer, and offer more comfort and fuel economy. Plastics are also more attractive because they are easily molded and colored, giving

free rein to designers' imaginations.

“Plastics and resins make up 20% of the weight of Embraer's aircraft, and the tendency is that the use of these materials will increase. We are replacing metals with resin and fiber compounds in internal and external structural components, such as flaps and rudders. As a result, these parts are lighter and we are eliminating stages in the manufacturing process,” says Francisco Rezende, who is in charge of Embraer's thermoplastics department. According to Rezende, plastic parts also make up 40% of the weight of the most advanced aircraft produced by Airbus in Europe and Boeing in the United States.

[Building greener cities, thanks to plastics](#)

From transportation to safety: Kevlar®, a polyamide that is as strong as steel and highly impact resistant, is used to make bulletproof vests. Made from plastic fiber, the safety netting installed in apartment windows is much tougher than metal bars. Not too long ago, Brazilian fire trucks carried wooden ladders. Today, firefighters use ladders made from heat-resistant plastic. Their clothing is also made from plastic compounds that offer guaranteed comfort and safety because they are fireproof. Soon, water will no longer be used to put out fires. A gel made from super-absorbent polymers is already on the market: it speeds up the firefighters' work and reduces the risk of fatalities with proven efficiency.

There would be fewer fires in Brazil if more buildings were made from non-flammable materials. In many countries, using fire-resistant plastic to build homes, apartment and office buildings and factories is standard practice. Brazilian companies make pre-fabricated houses that way, selling them in easily installed kits. However, they export most of their output.

Plastic household appliances, utensils and decorations are also a big hit in Brazil. Two Brazilian brothers – Humberto Campana and Fernando Campana – are internationally renowned furniture designers who work exclusively with multicolored plastics that are functional, attractive and comfortable. An Italian designer named Eero Aarnio was one of the first to use this technology. He makes chairs and tables from medium-density polyethylene. One of his creations, called Copacabana, imitates the wave-pattern of the beachside sidewalk in

Rio de Janeiro. “I like this material because it can take many forms. It is durable, and I can create fantastically colored articles. The furniture is always as clean and lovely as new,” he explains.

The same characteristics have led the printing industry to adopt plastics. Because they favor careful finishings, they give this highly competitive sector an important advantage. “We use plastics in shrink-wrap packaging for products with irregular shapes. We also make personalized packaging with die-stamped logos that could not be used on Styrofoam. Not only that, but plastics can be used to make smart labels and finishings for notebook covers,” says Carlos Cahestian, Production Manager for Flat Solutions at the Heidelberg printing firm in Brazil. It also goes without saying that plastics have replaced stone, wood and metal in printing plates, greatly reducing costs.

Consumption of plastics in Brazil is still low: just 24 kilos per person annually, which is lower than Argentina, where 27 kilos are consumed per person, and the USA, where per-capita consumption averages 155 kilos per year. “There are several advantages to using plastics instead of other materials. It takes less energy to produce them, plastics are a lucrative component for industry and they benefit people in general. Therefore, the market will tend to grow,” observes Braskem Technology and Innovation Director Luis Casinelli. He cites the example of Brazil’s overall strawberry production. The fruit is grown on plastic sheets that keep out pests, resulting in bigger berries. In the southern state of Rio Grande do Sul, where frost is farmers’ worst nightmare, plastic greenhouses protect their crops and ensure uninterrupted food production. On farms and ranches, plastic containers are replacing metal drums once used to store pesticides. Plastics are also used in dairy containers that do not alter the flavor and odor of the milk and protect it from contamination.

Plastics and their components are germ resistant, which is a key factor in their growing use in the health sector. Surgical gloves, masks and other kinds of medical equipment are no longer made of metal, glass or wood. Even blood bags, which were made of glass nearly 10 years ago, are now 100% plastic. The same is true for prostheses used to replace bones and joints. The result: a huge reduction in the transmission of diseases and hospital infections. Plastic also prevents the rejection of implants. The latest innovation in this area is artificial muscles, which are still being tested. Based on polymers that change shape when

stimulated electrically, these devices generate movement. Robots are being made from this material. Those who have seen them guarantee that they move like human beings.

[Replacing microchips with plastic film is only the beginning...](#)

Much more efficient – and invisible – dental braces are being made from plastic compounds. In eyewear, metal frames – even the most advanced titanium models – are being replaced with acetate, which is 50% lighter. Lenses made from a resin called C39 are not only more transparent than glass but weigh much less, which means more comfort for wearers. “Conventional materials are steadily being replaced with polycarbonate and other plastic resins. This is a clear trend in the optical sector. One reason for this is that plastics can be used to create personalized models, and people want to stand out from the crowd,” says Celso Minoru Ideriha, from C3 of Brazil, which has just launched a line of colorful eyewear for kids. “They’re brighter, lighter weight and easily adaptable, which prevents ear and nose injuries.”

Leonardo da Vinci was the first to imagine that visual deficiencies could be corrected with lenses placed directly in contact with the eyes. The first contact lenses were made of glass and covered the entire eyeball, which must have been incredibly uncomfortable. By 1940, they were being made from a special type of plastic used to make parts for bomber aircraft that flew during World War II. Today’s soft contacts are hydrophilic or gelatinous, made from a polymer that allows the eyes to breathe. According to estimates from the Brazilian Contact Lenses and Cornea Society (SOBLEC), 1.8 million Brazilians wear these more advanced corrective lenses. And just as many people with 20-20 vision like to wear contacts as a fashion accessory. They change the color of their eyes to match their clothes or mood.

The development of synthetic fibers has revolutionized the fashion industry. Modern “smart fabrics” made from microfibers neither wrinkle nor stain. They allow sweat to evaporate, keep the wearer warm or cool, are scented and hang perfectly. They even kill germs. Some fabrics have microchips woven into them to monitor the wearer’s body functions and sound an alarm whenever there is an abnormal change in temperature or heart rate, for example. Fabrics like these are advantageously replacing cotton, linen, Banlon, Helenca, Tergal, etc. But plastics are not just found in clothes. Today, only 25%

of shoe soles are made from leather, which has been replaced by more comfortable, non-skid plastics. In women's footwear, plastic is everywhere.

There is much more to tell about the world of plastic, including toys, balloons used to launch satellites, parachutes, musical instruments, cosmetics and everything you can possibly imagine in the field of civil construction. "The applications of plastics are making major headway in numerous markets. In the construction industry, for example, plastic offers a combination of factors like high performance and low maintenance," says Luciano Nunes, the Products and Services Manager at Braskem's Vinyls Business Unit. "Today, builders and users alike prefer products that are easy to install and shorten construction time without requiring constant maintenance, unlike conventional materials. Plastics meet all these requirements," observes Luciano Nunes.

The "age of plastic" is moving forward at such a fantastic pace that by the time you have finished this article, many interesting, functional and beautiful things will have been created. In all sectors of industry, plastics are replacing conventional materials and giving huge advantages into the bargain.

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